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US005868675A

United States Patent [19]

Henrion et al.

[11] Patent Number: 5,868,675

[45] Date of Patent: *Feb. 9, 1999

[54] INTERACTIVE SYSTEM FOR LOCAL
INTERVENTION INSIDE A
NONHOMOGENEOUS STRUCTURE

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5,572,999 11/1996 Fubda et al. 600/407

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Primary Examiner—Brian Casler
Attorney, Agent, or Firm—Blakely Sokoloff Taylor & Zafman

ABSTRACT

[57] An interactive system for a local intervention inside a region of a non-homogeneous structure, such as the skull of a patient, which is related to the frame of reference (R_2) of an operation table, and which is connected to a reference structure comprising a plurality of base points. The system creates on a screen a representation of the non-homogeneous structure and of the reference structure connected thereto, provides the coordinates of the images of the base points in the first frame of reference (R_1), allows the marking of the coordinates of the base points in R_2 , and allows the carrying out of the local intervention with an active member such as a trephining tool, a needle, or a radioactive or chemical implant. The system also optimizes the transfer of reference frames between R_1 and R_2 , from the coordinates of the base points in R_2 and the images in R_1 by reducing down to a minimum the deviations between the coordinates of images in R_1 and the base points in R_1 after transfer. The system also establishes real time bi-directional coupling between: (1) an origin and a direction of intervention simulated on the screen, (2) the position of the active member.

16 Claims, 13 Drawing Sheets

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[*] Notice: The terminal 36 months of this patent has been disclaimed.

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[22] PCT Filed: May 10, 1990

[86] PCT No.: PCT/FR90/00714

§ 371 Date: Jun. 22, 1992

§ 102(c) Date: Jun. 22, 1992

[87] PCT Pub. No.: WO91/04710

PCT Pub. Date: Apr. 18, 1991

[30] Foreign Application Priority Data

Oct. 5, 1989 [FR] France 89 13028

[51] Int. Cl.⁶ A61B 5/05

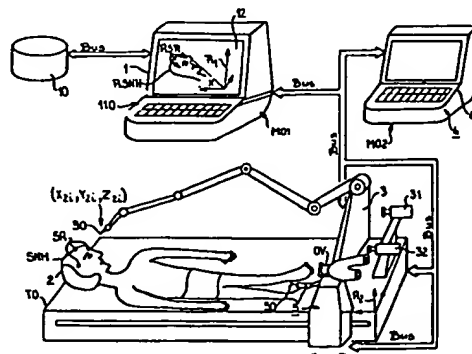
[52] U.S. Cl. 600/424; 606/130

[58] Field of Search 128/653.1; 378/4, 378/20, 41, 58, 205; 606/130; 901/6, 16, 41; 600/407, 411, 415, 417, 424

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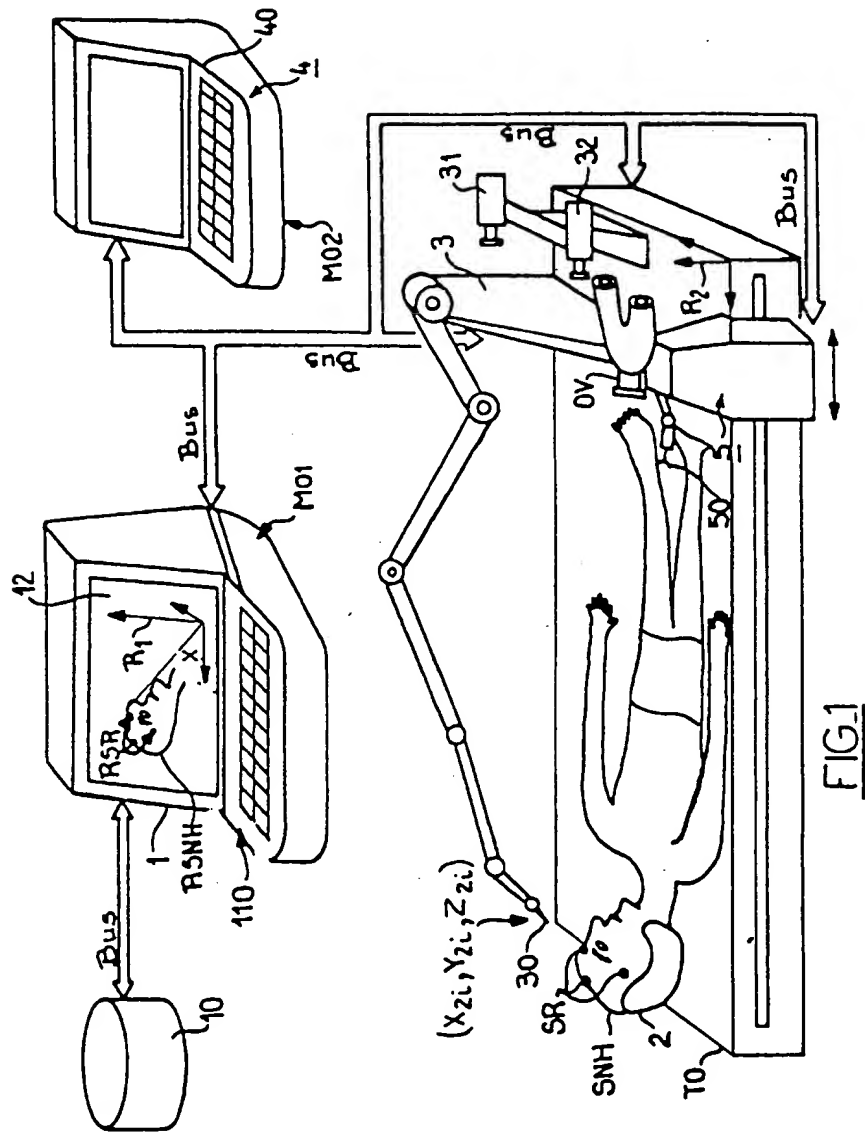
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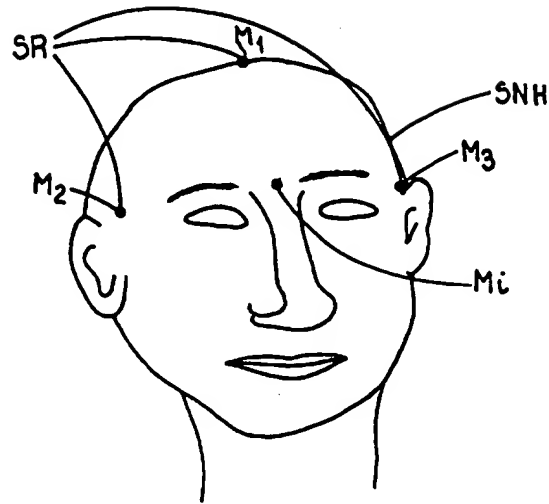


FIG. 2

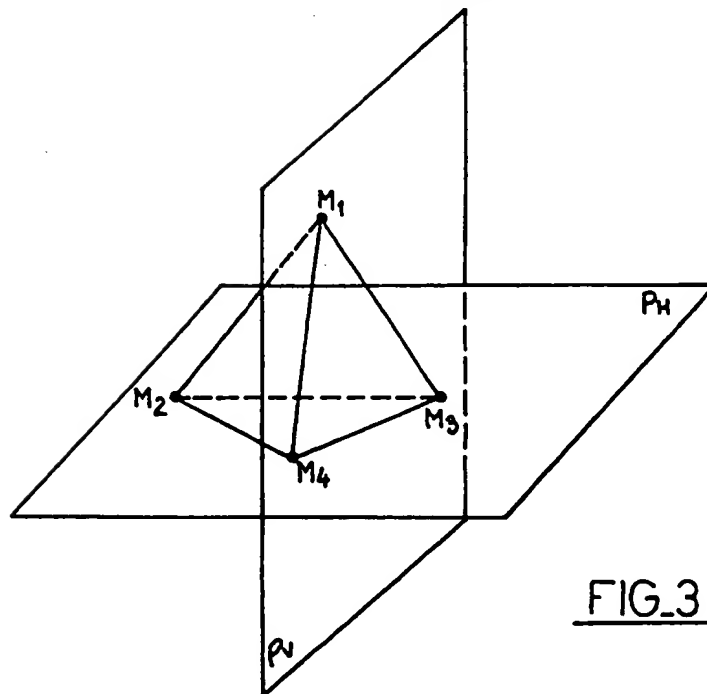


FIG. 3

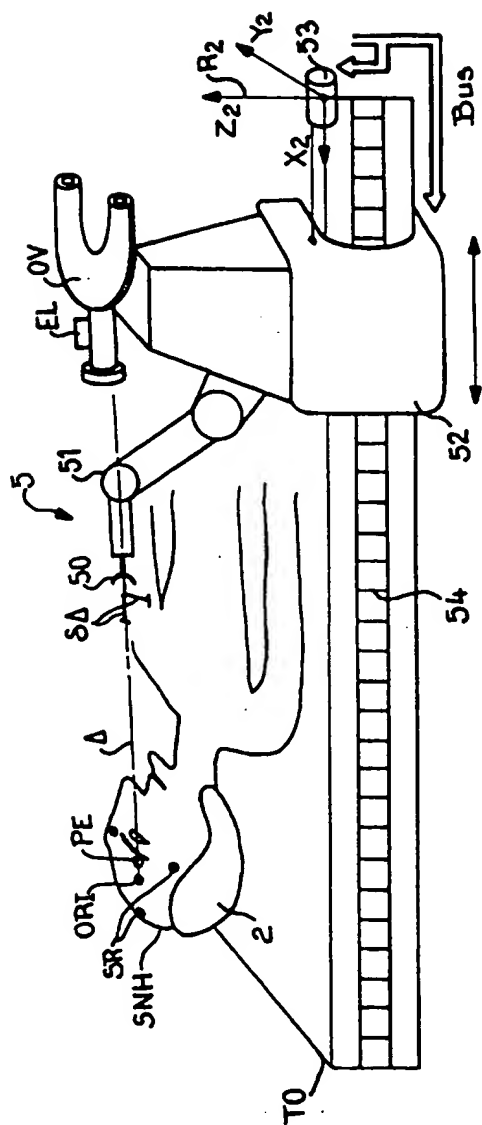
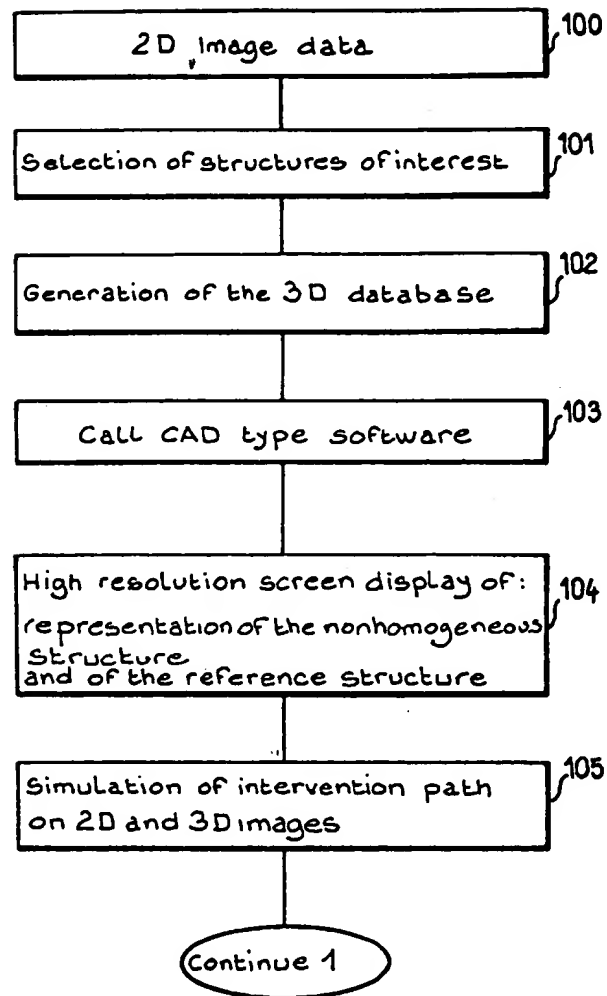
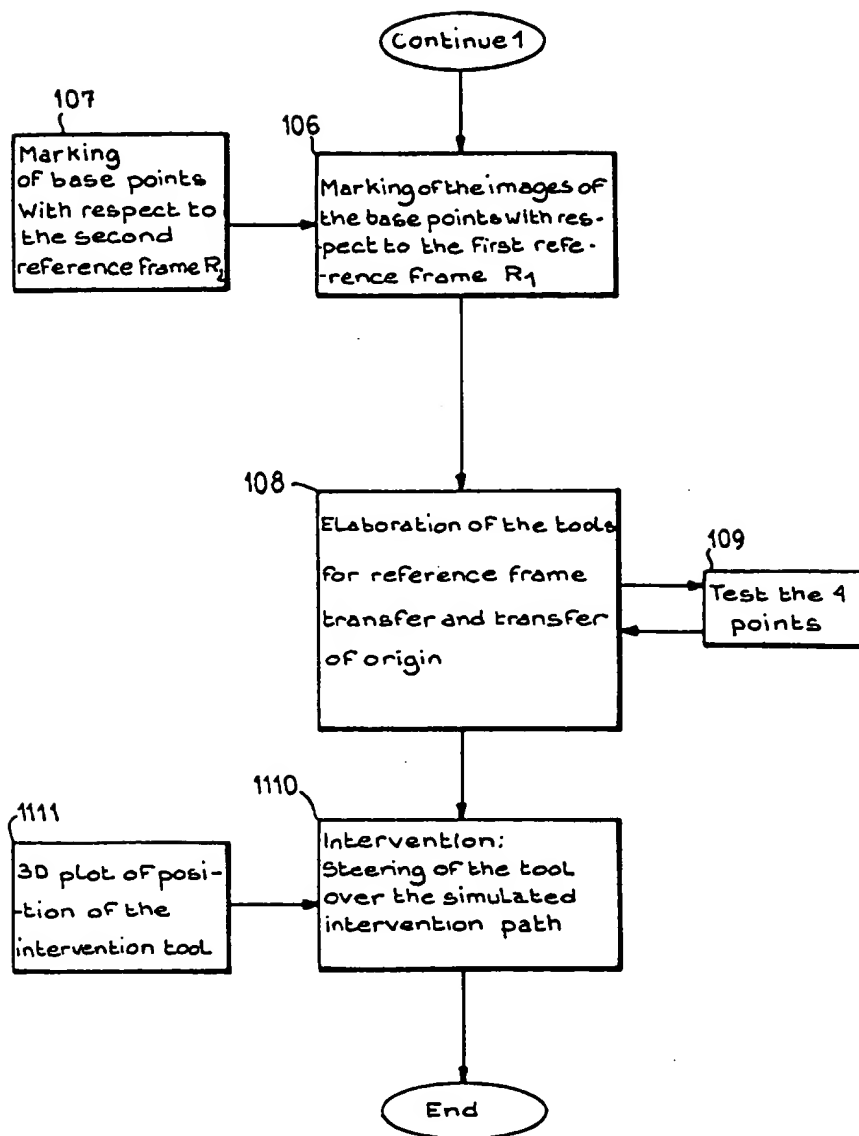


FIG. 4

FIG. 5a

FIG. 5b

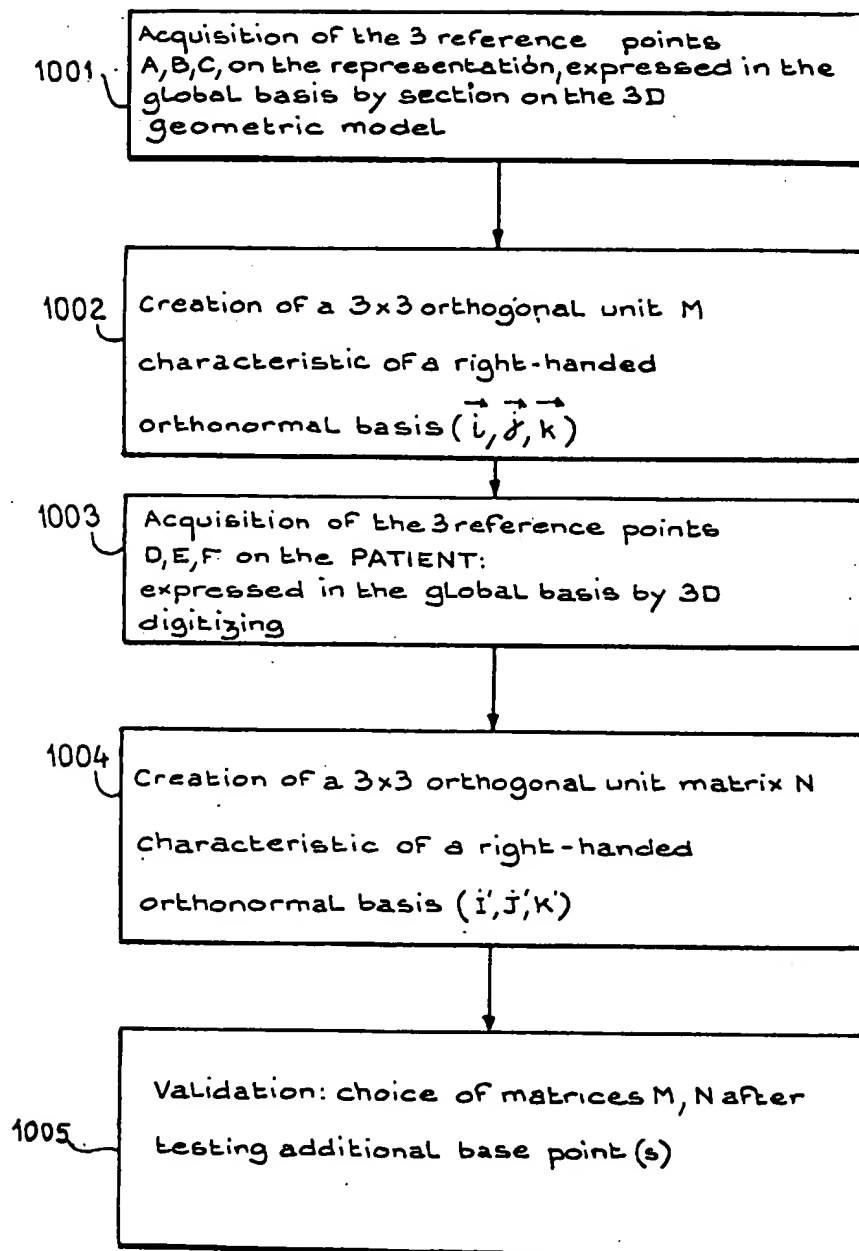
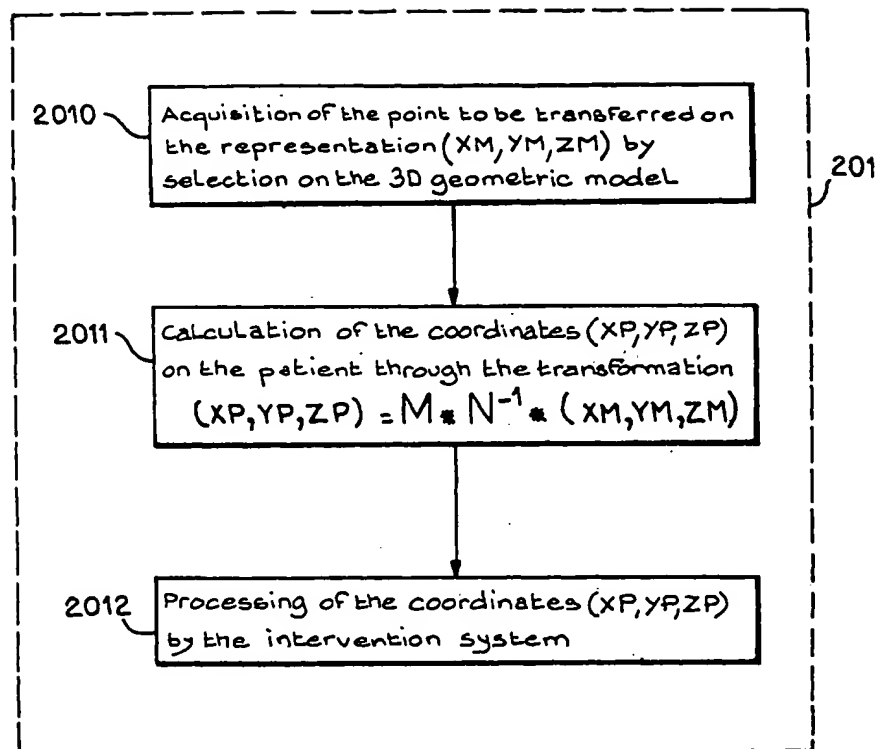
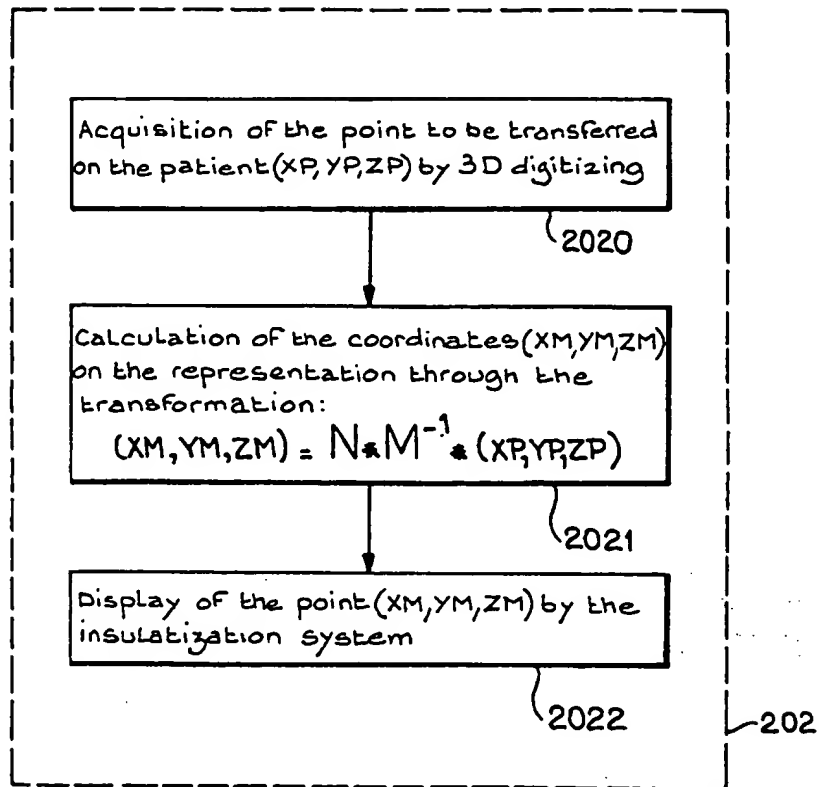


FIG 6

FIG. 7

FIG. 8